

A SYNOPSIS OF GUETTARDELLA BENTH. AND THE OLD WORLD SPECIES OF ANTIRHEA A.L. DE JUSSIEU (RUBIACEAE: GUETTARDEAE)

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SUMMARY

The generic differences between *Antirhea* Comm. ex A.L. de Juss. and *Guettardella* Benth. in Champ. (Rubiaceae: Guettardeae) are discussed. *Antirhea borbonica* J.F. Gmel. and *A. bifurcata* (Desr.) Hook. f., the only Old World species of *Antirhea* and until now inadequately known are fully described. In *Guettardella*, 10 new species are proposed and 8 new combinations are made.

INTRODUCTION

Antirhea was originally described as a genus by A.L. de Jussieu (1789) on a specimen collected by Commerson in Mauritius. On the same specimen was based *A. borbonica* J.F. Gmelin (1791). A later synonym is *A. dioica*, described by De Candolle (1830), who remarked that the flowers were dioecious by abortion (hence the epithet). On the other hand, he mentions of the other two species of *Antirhea*, *A. frangulacea* DC. and *A. verticillata* (Willd.) DC., both also found on Mauritius, that the flowers are hermaphrodite.

It is now known that *A. verticillata* is a synonym of *A. borbonica*, while *A. frangulacea* is a synonym of *A. bifurcata* (Desr.) Hook. f. and that the flowers of these species are actually hermaphrodite.

Obviously not thinking of a possible alliance to the geographically remote *Antirhea*, Benthham (1852) described the genus *Guettardella* based on a species from Hongkong (*G. chinensis*) and one from the Philippines (*G. philippinensis*). The first species is here selected as the type of the genus. In 1866 he added *G. putaminosa* from Australia and noted that the flowers were 'probably polygamous'.

Hooker f. (1873) placed *G. chinensis* in *Antirhea* and the other species were subsequently also removed to that genus, whereby generally *Guettardella* was considered to be congeneric.

This is not surprising, as the two genera seem to have a number of features apparently in common:

1. Unisexuality of the flowers had been reported for both genera.
2. The general appearance of the male inflorescences and flowers is similar.

3. The hypanthia (of the bisexual and female flowers) have a limited number of locules.
4. The fruits contain a horny putamen when ripe.

In the present study, however, it has been discovered that the two genera can be distinguished on several accounts:

	<i>Antirhea</i>	<i>Guettardella</i>
Flowers	hermaphrodite	unisexual, dioecious
Inflorescences	8–30-flowered	♂ inflorescences: 3–14-flowered ♀ inflorescences: 1–3-flowered
Cells of hypanthium	2 or 3	(3–)4–10(–14)
Provenance in the Old World	Mauritius	Southeast Asia, Australia, Pacific

Guettardella multiflora M.E. Jansen is exceptional in the genus for having 60–100 flowers in the male inflorescences and 13–30 in the female ones (hence its epithet). On the other hand, the flowers are unisexual, the hypanthium is 4- or 5-celled and the mature fruits show a putamen, whereby its relationship is clearly with *Guettardella*.

The genus *Antirhea* is said to occur in South America with a number of species as well. Some of these have been placed in *Stenostomum* Gaertn. f. (Britton & Wilson, 1925) or in *Neolaugeria* Nicolson (Nicolson, 1979). This problem could not fully be studied here, partly because the subject was a survey of the Old World species, partly because of lack of material. South American species were studied, as far as material of them was available, but a study of these species in this part of the New World is left here to future authors.

Antirhea A.L. de Juss. and *Guettardella* Benth. are members of the Guettardeae, the only tribe of the subfamily Antirheoideae, which is characterized by absence of raphides and locules of the hypanthium with only 1 pendulous ovule with little or no endosperm. *Antirhea* and *Guettardella* are distinct within the tribe because of the presence of a putamen in the mature fruits (pyrenes, fused into a single indurated mass). It is possible, that this putamen develops only later during maturation in some species. The position of *Guettarda kajewskii* Guillaum. is a doubtful one. It may be a *Guettardella*, but Merrill & Perry (1945) have suggested that the pyrenes remain distinct. Because this species was not represented by any material, *Guettarda kajewskii* is considered as a doubtful species in the present study.

The knowledge of the type of ripe fruits is usually essential to assign a taxon occurring in Malesia to either *Timonius* Rumph. or to *Guettardella* Benth. *Timonius* is another genus belonging to the Guettardeae. Like *Guettardella*, *Timonius* is widespread in this area and dioecious too. *Guettardella* is distinct from *Timonius* by the presence of at most 10, exceptionally 14 locules per hypanthium, while the latter has 12–many locules. Moreover, in the mature fruits of *Timonius*, a putamen is never present.

The species of *Guettardella* are apparently rare, local and in the herbaria usually represented by incomplete collections. Still, even in the absence of a completing series, it is very well possible to recognize distinct species. The genus can be divided

into two major groups, considering the size of the fruits. One group of species possesses large fruits, measuring $(14-17-30(-40) \times (7-11-25(-30))$ mm; the other group possesses smaller fruits, $3.5-8 \times 2-8$ mm. To the former group belong *G. erythrocarpa*, *G. megacarpa*, *G. novo-britanniense*, *G. oriomonense*, *G. pachyphylla*, *G. smithii*, *G. solomonense*, *G. schmutzii*. To the latter group belong *G. atropurpurea*, *G. caudata*, *G. chinensis*, *G. hexasperma*, *G. livida*, *G. microphylla*, *G. multiflora*, *G. obscura*, *G. ovatifolia*, *G. putaminosa*.

To a lesser extent, the shape of the apices of the stipules is correlating with this major dividing character. In both groups, stipules with acute apices occur, but in the group of species with larger fruits, this character tends only towards very short, broadly acuminate stipules; whereas in the species with smaller fruits, the apices of the stipules are in a number of them fine, narrowly long caudate.

Equally more or less correlated with the larger size of the fruits are further a higher number of locules in the hypanthia, the absence of ribs on the fruits and the possession of relatively larger leafblades.

An intermediate position between the two groups of species occupies *G. tenuiflora* of which the ribbed fruits measure $9-15 \times 5-10$ mm, the stipules are acute to slightly acuminate, in the hypanthia is a small number of locules present (3 or 4) and of which the leafblades are intermediate in size throughout the genus.

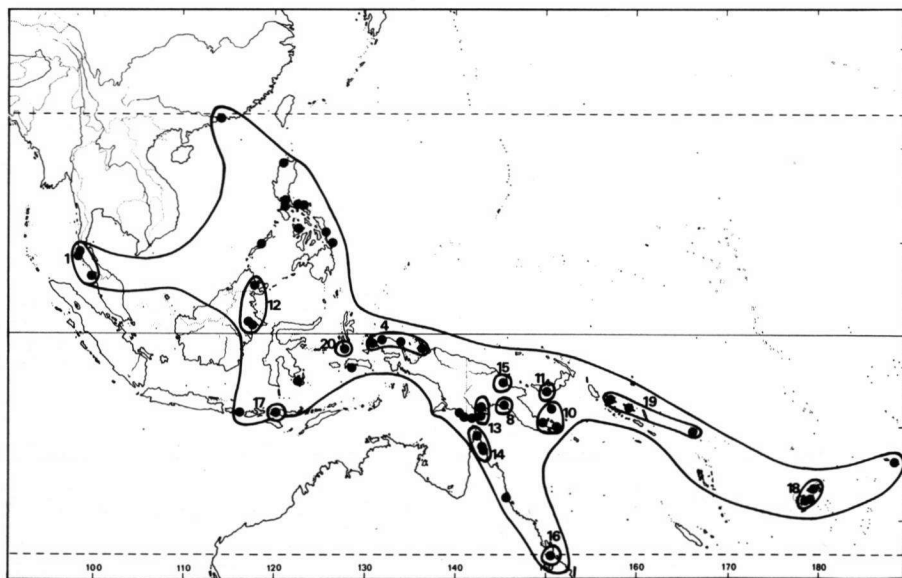


Fig. 1. Distribution of the genus *Guettardella* Benth. The encircled localities show the distribution of locally occurring species. Numbers refer to the numbers of these species.

No key to the species has been given here, because through lack of material the variation in the characters could not adequately be studied within the various species. To point out the various relationships between them, notes are therefore given under the species wherever appropriate.

Some species are apparently more or less restricted to limestone: *G. atropurpurea*, *G. erythrocarpa* (also on sand and clay), *G. hexasperma* (substrate only mentioned once), *G. multiflora* (also on beaches), *G. obscura*, see also under the species.

Finally, not all the types of the names here treated have been seen, while some material turned out to be on loan to Ms. Shu-miaw Chaw, New Orleans. Occasionally, I had therefore to rely upon the original descriptions and topotypical collections for their application. The majority of the species in *Guettardella* are local endemics (see Fig. 1); this local occurrence of the species facilitated the application of the names.

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1. ANTIRHEA

Antirhea Comm. ex Juss., Gen. Pl. (1789) 204; Schreb., Gen. Pl. ed. 8, 2 (1791) 789 ('*Antirrhea*'); DC., Prod. 4 (1830) 459 ('*Antirrhoea*'); Endl., Ench. Bot. (1841) 272 ('*Antirrhoea*'); De Cordemoy, Fl. Réunion (1894) 514 ('*Antirrhoea*'). — Type: *A. borbonica* Gmel.
Sturmia Gaertn., De Fruct. Suppl. 3 (1805) t. 192. — Type: *S. lucida* Gaertn.

1. *Antirhea borbonica* J.F. Gmel. — Fig. 2.

A. borbonica J.F. Gmel., Syst. 1 (Sept.-Nov. 1791) 244. — ['*Malanea*' Lam., Tabl. Encycl. 1, 1 (3 March 1791) t. 66¹, nomen] — *Malanea verticillata* Desr. in Lam., Tabl. Encycl. 1, 2 (13 Feb. 1792) 283 (text); Dict. 3, 2 (13 Feb. 1792) 688. — *Cunninghamia verticillata* Willd., Sp. Pl. 2 (1797) 615. — *A. verticillata* DC., Prod. 4 (1830) 459. — *Guettardella verticillata* Baill., Hist. Pl. 7 (1880) 377. — Types: *Commerson s.n.*, marked 'bois de losteau'; *Herb. Juss.* 9793 (P, holo); *Herb. Willd.* 2827 (B, iso).

A. dioica Bory ex DC., Prod. 4 (1830) 459. — [*'Malanea'* du Petit-Thouars, Mel. Bot. (1811) 56, nomen]. — *Guettarda dioica* Baill., Hist. Pl. 7 (1880) 377. — Type: *Thouin s.n.* (P, holo). *Guettarda barbinervis* Sieb. ex Cham. & Schlecht., Linnaea 4 (1829) 190. — *A. dioica* var. *barbinervis* DC., Prod. 4 (1830) 460. — Type: *Sieber nr. 61*, Fl. Maur. II (HAL, holo?, n.v.; L, iso). *A. dioica* var. *acuminata* DC., Prod. 4 (1830) 460. — Type: *Sieber nr. 60*, Fl. Maur. II (G, holo; L, iso).

Shrubs or treelets up to 8 m high. Main branches with the leaves in whorls of 3, lateral branchlets oppositely leaved. Stipules caducous, ovate to ovate-lanceolate, 4–9 × 1–3.5 mm, conspicuously keeled, outside moderately sericeous, glabrescent, inside densely long light brown sericeous, margins light brown sericeous, apex 2–3 mm acuminate. Petiole flat above, 3.5–5.5(–8) mm, glabrous. *Leafblade* obovate, (2.5–)3.5–12 × (1–)1.7–6 cm, coriaceous, above glabrous, below glabrous to sparsely pilose, when young sparsely hispid on midrib and sometimes on lateral nerves, margins glabrous, apex up to 6 mm acuminate, base attenuate; lateral nerves 4–6 pairs, in the axils domatia present, these densely hispid on young leaves. Inflorescence axillary, dichotomous, 8–11-flowered, solitary; peduncle 10–20 mm long, densely long sericeous, glabrescent. *Flowers* hermaphrodite, protandrous, sessile. Hypanthium subcylindrical, c. 1.2 × 0.8 mm, upper part moderately long sericeous, basally more densely so, glabrescent. Calyx cylindrical to slightly campanulate, 0.75–0.9 × 1.5–1.8 mm, outside sparsely sericeous, inside upper part glabrous, basally long densely hispid; lobes 4, ovate, 0.7–0.9 × 0.5–0.6 mm, margin moderately pubescent. Corolla tube cylindrical, 4.5–7.5 mm long, 0.5–1.0 mm wide basally, at the throat 1.0–1.5 mm wide, outside basally glabrous, upper 1 mm moderately sericeous, inside glabrous; lobes 4, oblong, 1.2–1.4 × 1.0–1.1 mm, outside moderately sericeous, inside glabrous, margin moderately sericeous, apex rounded. Stamens inserted at 3.5–6.5 mm from the base; anthers dorsiversatile, linear, 2.5–3 × 0.3–0.4 mm; filaments c. 0.6 mm long, long pilose. Disk a black carnosose ring, c. 0.2 mm high, c. 0.7 mm in diameter, glabrous. Style filiform, c. 2.5 mm long, glabrous; stigmas 2, filiform, c. 0.65 mm long, glabrous. *Fruits* 7–9 per infructescence, ovoid-lanceolate, 5–7 × 2–3 mm, apex and base rounded, glabrous; exocarp fleshy; locules 2, 4–6 × 0.5 mm; peduncle 1.5–3.5(–4.7) mm long, moderately long sericeous.

Distribution. Mascarene Islands.

MASCARENE ISLANDS. Mauritius I. Sieber Fl. Maur. II, nr. 60, 61 (both L), Fl. Mixta nr. 209 (L); Commerson ?396 (L); between Pêtrin and Grand Bassin, Coode 4431 (L).

Ecology. Shallow soil over lava. Altitude 660 m.

Field notes. Fruits green, ripening to purplish black.

2. *Antirhea bifurcata* (Desr.) Hook. f. — Fig. 2.

Malanea bifurcata Desr. in Lam., Encycl. Méth. 3, 2 (1792) 688. — *Stenostomum ? bifurcatum* DC., Prod. 4 (1830) 460, non Griseb. — *A. bifurcata* Hook. f. in Benth. & Hook. f., Gen. Pl. 2 (1873) 100; Urban, Symb. Antill. 1 (1900) 435; Verdc., Kew Bull. 38 (1983) 571. — Type: *Dupuy s.n.* (wrongly thought by Desrousseaux to originate from the Antilles, P-LA, holo). *A. frangulacea* DC., Prod. 4 (1830) 459. — Type: *Sieber nr. 59*, Fl. Maur. II (G, holo; L, iso).

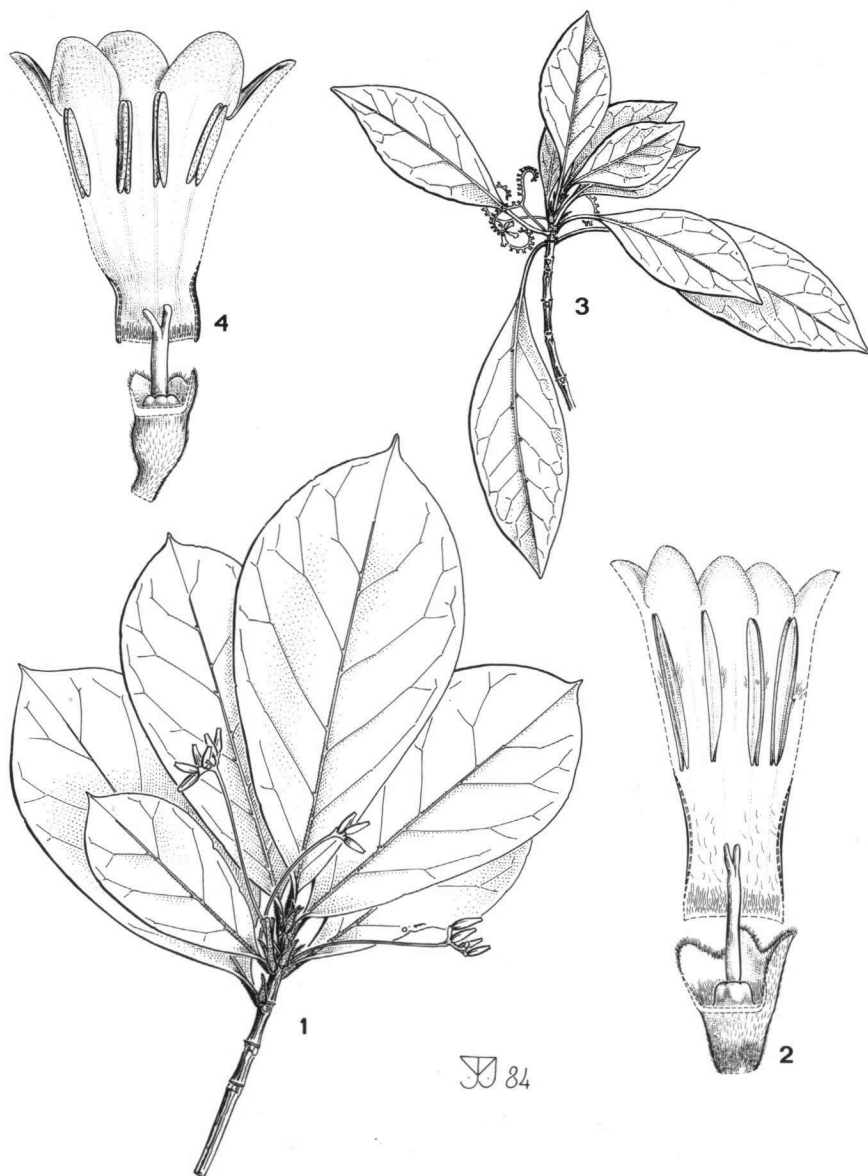


Fig. 2. *Antirhea borbonica* Gmel. 1. Habit, $\times \frac{1}{2}$; 2. male flower, $\times 10$ (1. Sieber nr. 60, Fl. Maur. II, 2. Sieber nr. 61, Fl. Maur. II). — *A. bifurcata* (Desr.) Hook. f. 3. Habit, $\times \frac{1}{2}$; 4. male flower, $\times 10$ (3. Sieber nr. 59, Fl. Maur. II, 4. Commerson ? 376).

Shrubs up to 1.8 m high. Main and lateral branches oppositely leaved. Stipules semi-persistent or caducous, ovate, $2-4 \times 1-1.5$ mm, slightly keeled, outside moderately short sericeous, glabrescent, inside densely sericeous, margins densely sericeous, apex acute or up to 2.5 mm acuminate. Petiole flat or canaliculate above, 4–10 mm, glabrous. *Leafblade* lanceolate, $3-7.5(-10.5) \times 1-4$ cm, chartaceous, above glabrous or very sparsely short pubescent, glabrescent, below and margins sparsely pubescent, glabrescent, apex acute, base acute to attenuate; lateral nerves 4–7 pairs, in the axils domatia present, these densely hispid on young leaves. Inflorescence axillary, dichotomous, (6–)17–30-flowered, solitary; peduncle (9–)11–22 mm long, moderately sericeous, glabrescent. *Flowers* hermaphrodite, protandrous, sessile. Hypanthium cylindrical, $1-1.3 \times 0.5-1$ mm, sparsely to moderately sericeous, glabrescent. Calyx cylindrical, $0.2-0.3 \times 0.9-1.1$ mm, outside moderately pubescent, inside glabrous; lobes 4, ovate, $0.45-0.6 \times 0.25-0.3$ mm, margin moderately to densely pubescent. Corolla tube infundibular, (3–)4–8 mm long, 0.5–0.9 mm wide basally, at the throat 1.2–1.8 mm wide, outside and inside glabrous; lobes 4, oblong, $1-1.8 \times 0.6-1.5$ mm, outside and inside glabrous, margin glabrous, apex broadly rounded. Stamens inserted at (2.5–)4–6 mm from the base; anthers sessile, dorsifixed, linear, $1.6-1.8 \times 0.25-0.35$ mm. Disk a light brown carnosose ring, 0.25–0.3 mm high, c. 0.65 mm in diameter, glabrous. Style filiform, c. 1.2 mm long, glabrous; stigmas 2 or 3, filiform, c. 0.55 mm long, glabrous. *Fruits* up to 20 per infructescence, ovoid, $1.5-2.5 \times 1-1.5$ mm, apex rounded, base broadly rounded, glabrous; exocarp fleshy; locules 2 or 3, $1-2 \times 0.5$ mm; peduncle 10–45 mm long, glabrous.

Distribution. Mascarene Islands.

MASCARENE ISLANDS. Mauritius I. Commerson ?376 (L); Sieber Fl. Mixta nr. 190 (L), Fl. Maur. II, nr. 59, 275 (both L); Herb. Hasskarl s.n. (L).

2. GUETTARDELLA

Guettardella Benth. in Champ., Hook. J. Bot. & Kew Misc. 4 (1852) 197; Benth., Fl. Aust. 3 (1866) 418; Bakh. f., Thai For. Bull. 9 (1975) 15, 53. – Type: *G. chinensis* Benth.

1. *Guettardella atropurpurea* (Craib) M.E. Jansen, *comb. nov.*

Timonius atropurpureus Craib, Fl. Siam. Enum. 2 (1932) 132; Henderson, J. Mal. Br. Roy. As. Soc. 17 (1939) 52; Chin, Gard. Bull. Sing. 35 (1982) 150. – *Timonius hirsutus* Ridl., J. Roy. As. Soc. Str. Br. 79 (1918) 81, non Merr., J. Roy. As. Soc. Str. Br. 77 (1917) 242, nec Merr., Philip. J. Sc. 17 (1920) 480. – Syn types: *Curtis* 2544 (n.v.); *Robinson* 6229 (n.v.).

Distribution. Thailand, Malay Peninsula.

PENINSULAR THAILAND. Surat Thani: Khao Lak, on road Surat-Takuapa, Smitinand & Sleumer 1187 (L). – Phuket: Trang, Kao Kao, Chawm Lem hill-summit, Rabil 309 (L).

MALAY PENINSULA. Perak. ('one locality', fide Chin, 1982). – Langkawi I. Selat Panchor, mainland side, Chin 1834 (L); east coast, Soepadmo & Mahmud 1255 (L); east end facing P. Timun, Stone 11010 (L); Kerr 21738 (L).

Ecology. Shrubs up to 3 m high. Limestone ridges or cliffs. Altitude 0–250 m.

Field notes. Flowers white. Fruits pale green or green when young, purple when mature.

Note. Henderson (1939), followed by Chin (1982) stated that *G. atropurpurea* is possibly restricted to limestone. The specimens studied and those mentioned in the literature all originate from only four localities: Peninsular Thailand (Surat Thani, Phuket) and Malay Peninsula (Perak, Langkawi I.). Two of the specimens studied (Chin 1834 and Stone 11010) were reported to be collected on limestone on the Langkawi Islands. It is well-known that extensive limestone massifs predominate on these islands. Smitinand & Sleumer 1187 from Khao Lak (Thailand) was found on limestone too.

2. *Guettardella caudata* M.E. Jansen, *spec. nov.* – Fig. 3.

Arbusculae usque ad 7 m altae. Stipulae deciduae ovato-lanceolatae, 4–10 mm longae, 2–4.5 mm latae, apicibus 2–5 mm caudatis. Lamina folii oblonda, (3.5–)4–7 cm longa, (1.5–)2.5–4 cm lata, apice 7–10 mm acuminato, basi acuta ad rotundata, nervibus lateralibus 4–6 paribus. Inflorescentia 1–8 floribus, pedunculus 18–42 mm longus. Flores masculi cum pedicello 0–2.5 mm longo. Bracteola una 2–3 mm longa. Calyx campanulatus, (0.3–)0.5–0.7 mm longus, (0.4–)0.8–1.5 mm latus, lobi acuti, unum aliis multo brevior. Tubus corollae cylindricus, 6.2 mm longus, 0.9 mm diametro. Antherae 5.5 mm supra basin tubi insertae. Discus cylindricus, 0.18 mm altus, 0.54 mm diametro, dense breviter hirsutus. Stylus 2.6 mm longus, 0.18 mm latus, pilosus; stigmata 0.9 mm longa, glabra. Flores feminei alabastraria tantum video. Pedicellus 0–1.5 mm longus. Bracteolae 1 vel 2, 1.5–3.0 mm longae. Hypanthium campanulatum 0.6 mm longus, 0.2–0.5 mm in diametro. Calyx cylindricus, 0.8 mm longus, 1.0 mm latus, unum aliis multo brevior. Fructus ignoti. – T y p u s : *Sulit PNH 12315* (L, holotype; PNH, iso, n.v.).

Treelets up to 7 m high. Stipules twisted, deciduous, ovate-lanceolate, 4–10 × 2–4.5 mm, not keeled, outside long moderately to densely pubescent, glabrescent, inside glabrous to moderately short sericeous, margins sparsely to moderately pilose, apex 2–5 mm caudate. Petiole flattened to a bit canaliculate above, 3–15 mm, densely sericeous, glabrescent. Leafblade oblong, (3.5–)4–7 × (1.5–)2.5–4 cm, membranous, above sparsely short pubescent, glabrescent, below moderately long sericeous, more densely so on midrib and nerves, glabrescent, margins moderately long pilose, glabrescent, apex acute or up to 10 mm acuminate, base acute to rounded; lateral nerves 4–6(–8) pairs. Inflorescence axillary, solitary, dichotomous, with either 3–8(–11) male flowers or 1 or 2 female flowers; peduncle 18–42 mm long, moderately to densely pubescent, glabrescent. Male flowers: Pedicel 0–2.5 mm long, moderately pubescent. Bracteoles 1 per flower, filiform, 2–3 mm long, basally pubescent, upper part glabrous. Calyx campanulate, (0.3–)0.5–0.7 mm long, 0.8–1.5 mm in diameter above, 0.4–0.9 mm in diameter below, outside glabrous or sparsely to moderately pubescent, inside glabrous; lobes 4, 3 of which linear, 2.4–5.3 × 0.35–0.6 mm, one ovate, 0.6–0.85 × 0.25–0.3 mm, outside long sparsely to moderately pubescent, inside glabrous, apex acute. Corolla tube cylindrical, c. 6.2 × 0.9 mm, outside sparsely pubescent, inside glabrous; lobes 4, oblong, 1.1–1.2 × 0.6–0.7 mm, outside hirsute-pubescent, inside glabrous, apex rounded. Stamens inserted

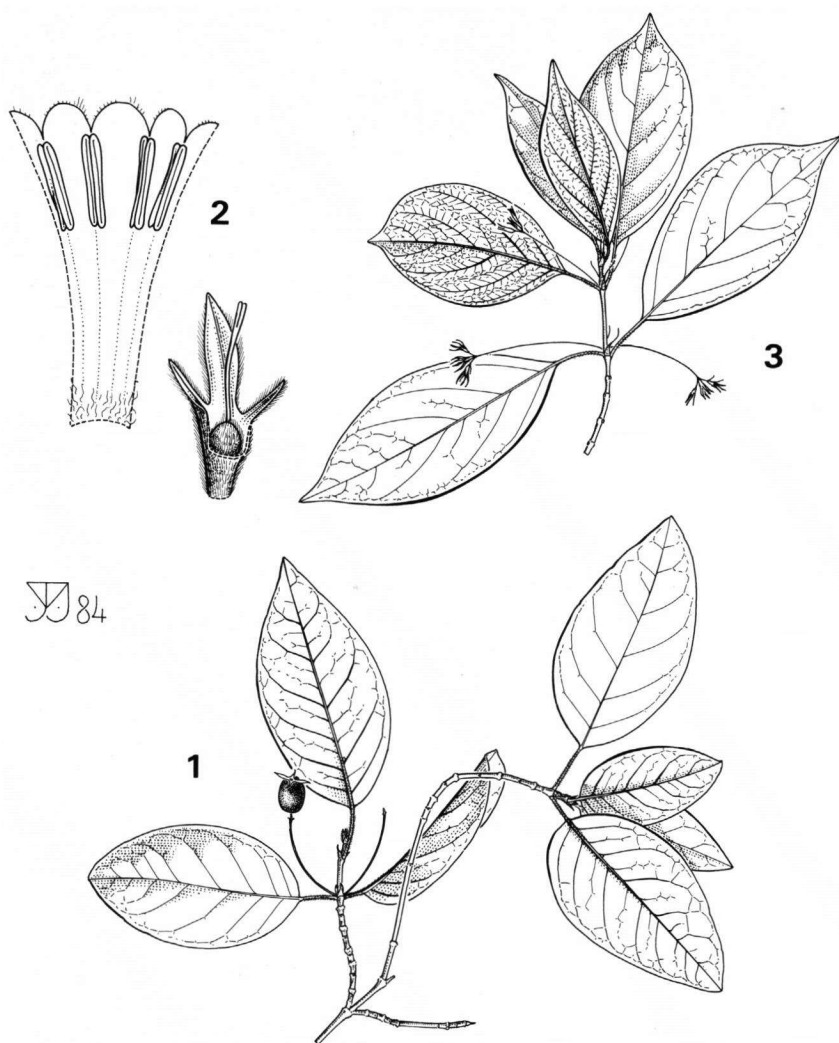


Fig. 3. *Guettardella ovatifolia* M.E. Jansen. 1. Habit, $\times \frac{1}{2}$; 2. male flower, $\times 7\frac{1}{2}$ (1. Brass 18667, 2. Brass 19599). — *G. caudata* M.E. Jansen. 3. Habit, $\times \frac{1}{2}$ (3. Sulit PNG 12315).

at 5.5 mm from the base; anthers already open in young buds, linear, c. $1.8 \times 0.25-0.3$ mm, sessile. Disk a carnosose ring, c. 0.2 mm high, c. 0.55 mm in diameter, densely white shortly hirsute. Style filiform, c. 2.6×0.2 mm, very sparsely short pilose; stigmas 2, filiform, c. 0.9×0.1 mm, glabrous. Female flowers: only seen in bud; pedicel 0–1.5 mm long, sparsely pilose to moderately pubescent. Bracteoles 1 or 2 per flower, filiform, 1.5–3 mm long. Hypanthium campanulate, c. 0.6 mm

long, c. 0.5 mm in diameter above, c. 0.2 mm in diameter below, moderately to densely pubescent. Calyx cylindrical, c. 0.8×1 mm, outside glabrous, inside glabrous; lobes 4, 3 of which lanceolate to linear, $2-4 \times 0.5-0.75$ mm, one linear, $2-3 \times 0.5-0.7$ mm, outside and inside glabrous. Fruits unknown.

Distribution. Philippines.

PHILIPPINES. Palawan. Aborlan, Victoria Mts, Sulit PNH 12315 (L). – Luzon. Camarines Norte Prov., Mt Kadig, Edaño PNH 40180 (L).

Ecology. On densely forested riverbanks. Altitude 100 m.

Field notes. Flowers pale pink.

Notes. A conspicuous character of this species is the shortly hirsute disk in the male flowers, also met with in *G. obscura*. *Guettardella caudata* is named after its long caudate stipules, a character in which this species is particularly related to *G. hexasperma*, *G. livida*, *G. microphylla* and *G. obscura*. *Guettardella caudata* differs, however, from *G. hexasperma* in the length of the leaves and the number of lateral nerves; both from *G. hexasperma* and *G. livida* in the larger number of male flowers per inflorescence in the two latter species; from *G. microphylla* in the shorter peduncled male inflorescences in this species.

Another conspicuous character of *G. caudata*, in which it is easily recognizable from the other four species mentioned above, is the unequal length of the calyx-lobes in the male flowers. In this character *G. caudata* is related to *G. ovatifolia*.

3. *Guettardella chinensis* Benth. in Champ.

G. chinensis Benth. in Champ., Hook. J. Bot. & Kew Misc. 4 (1852) 197. – *Antirhea chinensis* Benth. & Hook. f. ex Forbes & Hemsley, J. Linn. Soc. Bot. 23 (1888) 384; Robinson, Proc. Amer. Ac. 45 (1910) 407. – Syntypes: *Champion s.n.*, Mt Gough (n.v.); *Champion s.n.*, Mt Victoria (n.v.), both Hongkong.

Distribution. Hongkong, Philippines.

HONGKONG. Hillside, Wright s.n. (L).

PHILIPPINES. Palawan. Panacan, southeast slope Mt Victoria, Sulit 3873 (L).

Ecology. Shrubs or small trees up to 5 m high, on rocky ridges in dense forest. Altitude up to 1000 m.

Field notes. Male flowers white. Female flowers yellow. Fruits black or dark purple.

4. *Guettardella erythrocarpa* M.E. Jansen, *spec. nov.*

Arbusculae usque ad 30 m altae. Stipulae caducae vel interdum semi-persistentes, triangulatae, (2-)4-7 mm longae, 1.5-3 mm latae, apicibus acutis ad leviter acuminatis. Lamina folii oblonga usque ad leviter obovata vel lanceolata, 7-19(-21) cm longa, 4-8.5(-10) cm lata, apice acuto, basi rotundata ad obtusa ad acuta, nervibus lateralibus 5-9 paribus. Inflorescentia et flores ignoti. Fructus globosus; loculis 8-11; pedicello 18-29 mm longo. – Typus: *Versteegh BW 4759* (L, holo).

Trees, up to 30 m high. Stipules not twisted, caducous (sometimes tardily so), triangular, (2–)4–7 × 1.5–3 mm, outside densely light brown sericeous, inside densely sericeous, margins moderately sericeous, apex acute to slightly acuminate. Petiole canal-iculate to slightly flattened above, 8–14 mm long, densely sericeous lanate when young slightly glabrescent. *Leafblade* chartaceous, oblong to slightly obovate or lanceolate, 7–19(–21) × 4–8.5(–10) cm, above glabrous, below glabrous to moderately pubescent on midrib, margins glabrous, apex acute or up to 15 mm acuminate, base rounded or obtuse to acute, lateral nerves 5–9 pairs. Inflorescence and flowers unknown. *Fruits* 1 per infructescence, globose to ovoid, 18–26 × (11–)21–23 mm, glabrous; exocarp fleshy; locules 8–11, cylindrical, 20 × 0.8–1.2 mm; pedicel laterally strongly flattened, 24–36 mm long, moderately to densely light brown pubescent-sericeous.

Distribution. New Guinea.

NEW GUINEA. Salawati I. Kaloal, Koster BW 1393, BW 1444, BW 1469, BW 4264 (all L). – Vogelkop Peninsula. E. of Sorong, Warsamson R., Schram BW 2955, BW 12465; Moll BW 11571, BW 11678, BW 11685 (all L); Manokwari, Koster BW 4338, BW 10834, BW 10978, BW 11925; Bouwer BW 398; Lorenzo BW 7256; Moll BW 15667; Versteegh BW 4759 (all L). – Japen I. Seroei, Aisaoe, Iwangin BW 10026; Schram BW 10528 (both L).

Ecology. In primary, sometimes in the wet season inundated forests or (old) secondary forests. Also in marsh forests, inundated at high tide. Usually on sandy or stony clay or clayey soil, sometimes on coral limestone with a small layer of clay (Versteegh BW 4759). Altitude 0–250 m.

Field notes. Bole up to 17 m high, d.b.h. up to 58 cm. Buttresses when present up to 2 m high, up to 50 cm wide, up to 10 cm thick. Outer bark not fissured, not or a little (sometimes strongly) peeling, smooth, (dark) brown to brown-purplish to black; inner bark white to brownish yellow or yellowish green with little purple sap, without exudate, with sweet smell. Slash up to 12 mm, yellow to reddish brown, layered. Sapwood yellow to brown. No hardwood. Fruits green, turning red during maturation.

Vernacular names. Bengemoen (Hattam lang., Manokwari), mbeb, mbep, seboreroko, wobbrijka (Manikiong lang., Salawati I.), fokko, jòhko, soebekwa (Manikiong lang., Manokwari), koeloe, soewelen, wiem, wien, wim (Mooi lang., Sorong), kadoipi (Roberbai dial., Japen I.), adoriap (Samber dial., Japen I.).

Notes. Although *G. erythrocarpa* is one of the most well-represented species among the material studied, none of the specimens present possessed male or female flowers. Possibly, the flowers of this species are in bloom for only a very short time.

I named this species after its large red fruits, a character in which the species, together with the ovate or triangular acute stipules and its large, mostly oblong, ovate or obovate leafblades is related to *G. novo-britanniense*, *G. oriomonense*, *G. pachyphylla*, *G. smithii*, *G. schmutzii* and *G. solomonense*.

5. *Guettardella hexasperma* (Roxb.) M.E. Jansen, *comb. nov.*

Pyrostria hexasperma Roxb. [Hort. Beng. (1814) 83, nomen nud.], Fl. Ind. ed. Carey 1 (1820) 403; ed. 2, 1 (1832) 388; repr. (1874) 130. – Type: *Roxburgh s.n.*, Honimoa (Saparoea), Moluccas (n.v.).

Eriosolena affinis Zoll., Syst. Verz. (1854) 116; Miq., Fl. Ind. Bat. 1, 1 (1858) 878. – Type: Zollinger 3209 (L, iso).

Bobea hirsutiuscula Teysm., Nat. Tijdschr. Ned. Ind. 29 (1867) 247. – *Antirhea hirsutiuscula* Valetton, Bull. Dépt. Agric. Ind. Néerl. 26 (1909) 31; Ic. Bog. 4 (1914) 113, 114, t. 335. – *Timonius hirsutiusculus* Burck ex Elmer, Leaf. Philip. Bot. 4 (1912) 1329. – Type: Teysmann & Binnendijk s.n. (L, iso).

Polyphragmon trichocaulon Miq., Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 241. – *Timonius trichocaulus* Boerl., Handl. Fl. Ned. Ind. 2, 1 (1891) 132. – Type: de Vriese s.n. (L, holo).

Timonius attenuatus Elmer, Leaf. Philip. Bot. 1 (1906) 34. – Syntypes: Merrill FB 2805 (n.v.); Ahern FB 1867 (n.v.).

Distribution. Lesser Sunda Islands, Celebes, Moluccas, Philippines.

LESSER SUNDA ISLANDS. Lombok. Zollinger 3209 (L).

CELEBES. Buton I. Bau-bau, Elbert 2609 (L).

MOLUCCAS. Ceram. de Vriese s.n. (L). – Saparoea. Teysmann & Binnendijk s.n. (L); Cult. Hort. Bog. 437 (L). – Ambon. Ema, Teysmann s.n. (L); Cult. Hort. Bog. IV E 50 (L); IV E 50a (L).

PHILIPPINES. Luzon. Rizal Prov., Merrill FB 2805 (n.v.); Cagayan Prov., Ahern FB 1867 (n.v.); Batangas Prov., Ramos 1865 (L).

Ecology. In Buton I. found in a very dry habitat on coral limestone. Altitude up to 75 m.

Notes. Roxburgh described the fruits as 'with as far as 6–8 one-seeded nuts'. Apparently, he must have had only very young material at his disposal, in which the putamen had not yet developed.

Guettardella hexasperma is closest related to *G. livida*. Both species possess very long caudate stipules and a relatively large number of male flowers in the inflorescences. They differ from each other in the size and shape of the fruits and the number of these in the infructescences.

6. *Guettardella inconspicua* (Seem.) M.E. Jansen, *comb. nov.*

Guettarda inconspicua Seem., Fl. Vit. (1866) 131; Gillespie, Mus. Bull. 91 (1932) 29, t. 32. – Type: Seemann 257 (BM, holo; n.v.).

Guettarda vitiensis A. Gray, Proc. Amer. Ac. 5 (1861) ?, nom. nud.

Distribution. Fiji Islands, Samoa.

FIJI ISLANDS. Ovalau. Seemann 257.

SAMOA. West. Upolu, Lefaga, Bristol 2318 (L).

Ecology. In Samoa found on very steep rocky coast.

Field notes. Small trees, 6 m high. In the male flowers the corolla tube is dull red, the throat and corolla lobes pale yellow.

Vernacular name. Fales'ela (Samoa).

7. *Guettardella livida* (Elmer) M.E. Jansen, *comb. nov.*

Antirhea livida Elmer, Leaf. Philip. Bot. 4 (1912) 1327. – Type: Elmer 12968 (L, iso).

Distribution. Philippines.

PHILIPPINES. Palawan. Mt Pulgar ('Thumb Peak'), Puerto Princesa, Elmer 12968 (L). — Siargao I. Ramos & Pascasio BS 34916 (L). — Luzon. Ramos & Edaño 28869 (L).

Note. For relationships see under *G. hexasperma*.

8. *Guettardella megacarpa* (Merr. & Perry) M. E. Jansen, *comb. nov.*

Antirhea megacarpa Merrill & Perry, J. Arn. Arbor. 26 (1945) 234. — Type: Brass 946 (A, holo; n.v.).

Distribution. New Guinea.

NEW GUINEA. South. Gulf Dist., junction Vailala R. and Lohiki R., Schodde & Craven 4293 (L).

Ecology. On primary alluvial forest. Altitude 20 m.

Field notes. Slight buttresses present. Bark pocked and finely pustular grey; blaze pale brown; wood dark cream.

9. *Guettardella microphylla* (DC.) M. E. Jansen, *comb. nov.*

Guettarda microphylla Bartling ex DC., Prod. 4 (1830) 457; F.-Villar, Novis. App. (1880) 109. — *Antirhea microphylla* Merr., Enum. Philip. Fl. Pl. 3 (1923) 540. — Type: Bartling s.n. in Herb. Haenke (n.v.).

Guettardella philippinensis Benth. in Champ., Hook. J. Bot. & Kew Misc. 4 (1852) 197. — *Antirhea philippinensis* Rolfe, J. Linn. Soc. Bot. 21 (1884) 312; Vidal, Phan. Cuming. Philip. Pl. (1885) 119; Elmer, Leaf. Philip. Bot. 3 (1911) 1009; *ibid.* 4 (1912) 1329. — Type: Cuming 1827 (n.v.).

Timonius benguetensis Elmer, Leaf. Philip. Bot. 1 (1906) 35. — *Antirhea benguetensis* Valetton Bull. Dépt. Agric. Ind. Néerl. 26 (1909) 32. — Type: Elmer 6396 (n.v.).

Distribution. Philippines, Moluccas.

PHILIPPINES. Palawan. Mt Pulgar ('Thumb Peak'), Puerto Princesa, Elmer 13237 (L). — Luzon. Rizal Prov., Quezon, Mt Atimonau, Hernaez 1395 (L); Ilocos Norte Prov., Burgos, Ramos BS 33450 (L). — Panay. Capiz Prov., Mt Salibongbong, Martelino & Edaño BS 35596 (L). — Samar. Guinmaayahan, Balangiga, Madulid et al. 1359 (L).

MOLUCCAS. Talaud I. Karakelang, E. slope of Mt Piapi, Lam 3260 (L).

Ecology. On rocky soil, on open slopes. Altitude 350–450 m.

Field notes. Trees 5–7 m high, d.b.h. 30 cm. Male flowers with dirty red calices and light red corollas. Fruits black.

Vernacular name. Omin'a (Talaud I.).

Note. *Guettardella microphylla* is closest related to *G. caudata* through the size of the leaves and the caudate stipules. The two species differ from each other in the long-peduncled male inflorescences and the unequal length of the calyx lobes of the male flowers in *G. caudata*.

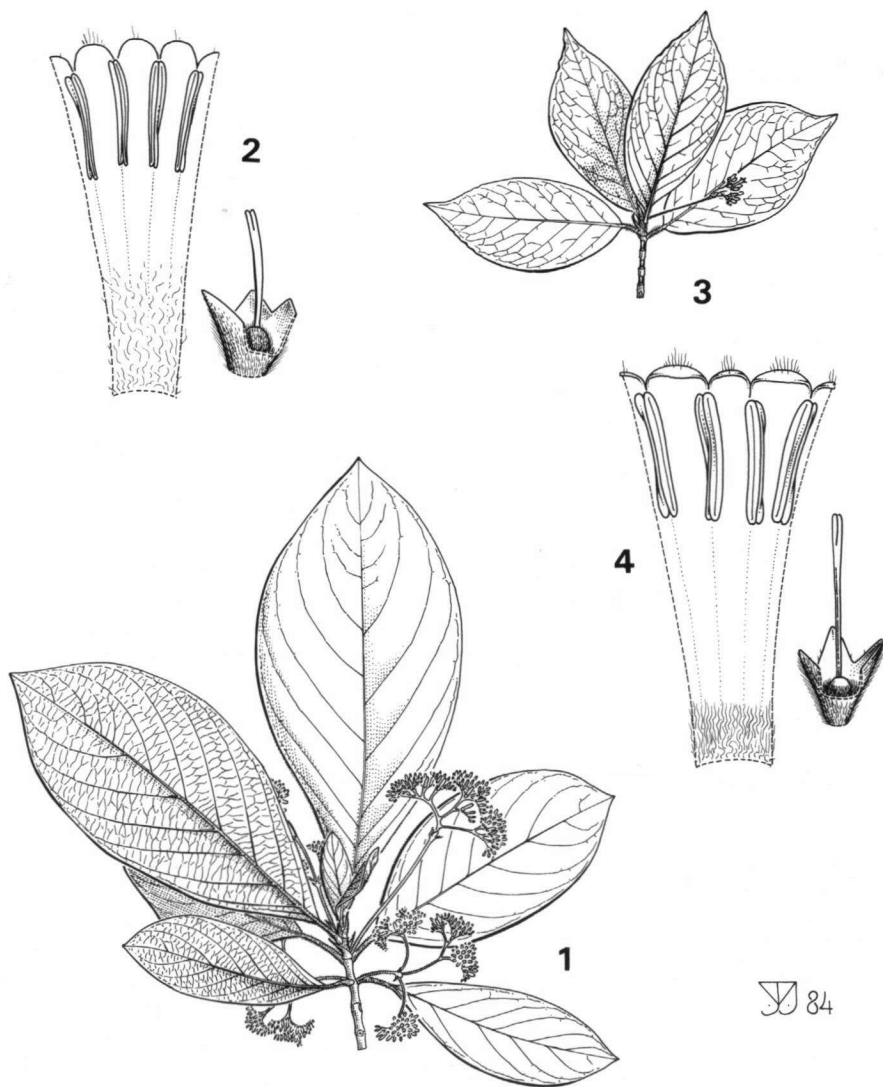


Fig. 4. *Guettardella multiflora* M.E. Jansen. 1. Habit, $\times \frac{1}{2}$; 2. male flower, $\times 7\frac{1}{2}$ (1 & 2. Saunders 151). – *G. obscura* M.E. Jansen. 3. Habit, $\times \frac{1}{2}$; 4. male flower, $\times 7\frac{1}{2}$ (3. Wood SAN A4623, 4. Kostermans 5962).

10. *Guettardella multiflora* M.E. Jansen, *spec. nov.* – Fig. 4.

Arbusculae usque ad 6 m altae. Stipulae caducae, ovatae ad ovato-lanceolatae, 5–7 mm longae, 2–3.5 mm latae, apicibus 1.5–5 mm caudatis. Lamina folii lanceolata, 5–17 cm longa, (1.5–)2–

6.5 cm lata, apice acuto vel ad 7 mm acuminato, basi acuta, nervibus lateralibus 6–9 paribus. Inflorescentia 10–100-floribus, pedunculo 7–38 mm longo. Flores masculi sessiles. Bracteolae 2 vel 3, 2–3 mm longae. Calyx cylindricus, 0.4–0.5 mm longus, 0.9–1.1 mm latus, lobi aequilongi. Tubus corollae cylindricus, 5.5 mm longus, 0.6 mm latus. Antherae c. 5 mm supra basin tubi insertae. Discus conicus, c. 0.2 mm altus, 0.3 mm latus, glabre. Stylus 2.8 mm longus, 0.2 mm latus, glaber; stigmata desunt. Flores feminei alabastria tantum cogniti, sessiles. Bracteola una, 2–3 mm longa. Hypanthium cylindricum, c. 1.2 mm longum, c. 0.7 mm latum. Calyx cylindricus, c. 1 mm longus, c. 0.4 mm latus, lobi aequilongi. Fructus 4–8 pro infructescentia, 4- vel 5-costata, 4 vel 5 loculis. — *Typus*: Brass 21936 (L, holo).

Trees up to 6 m high, d.b.h. up to 8 cm. Stipules twisted, caducous, ovate-lanceolate, 5–7 × 2–3.5 mm, outside densely sericeous, inside upper half sparsely to moderately pubescent, lower half densely long sericeous, margins glabrous, apex 1.5–5 mm acuminate to caudate. Petiole 4–21 mm, cylindrical, densely sericeous, not glabrescent. *Leafblade* lanceolate to (sometimes) obovate-lanceolate, 5–17 × (1.5–)2–6.5 cm, membranous, above sparsely to moderately sericeous on midrib and nerves, sparsely pilose between them, below long very densely sericeous on midrib and nerves, moderately so between them, margin glabrous, apex acute or up to 7 mm acuminate, base obtuse to acute; lateral nerves 6–9 pairs. *Inflorescence* axillary, solitary, a thyse, with either 60–100 male flowers or 13–30 female flowers; peduncle 7–38 mm long, sparsely to densely, (sometimes) long sericeous-lanate. *Male flowers*: sessile. Bracteoles 2 or 3 per flower, filiform, 2–3 mm long, pubescent. Calyx cylindrical, 0.4–0.5 × 0.9–1.1 mm, outside moderately long sericeous, inside upper half glabrous to sparsely pubescent, lower half densely long sericeous; lobes 4, ovate, 0.3–0.5 × 0.3–0.6 mm, outside glabrous to moderately sericeous, inside glabrous to sparsely pubescent, apex rounded. Corolla tube cylindrical, c. 5.5 × 0.6 mm, outside moderately sericeous-lanate, inside lower 2.5 mm moderately very long hirsute, upper part glabrous; throat glabrous; lobes 4, oblong, 1.35–1.65 × 0.9–1.1 mm, outside moderately short sericeous-lanate, inside glabrous, margin glabrous, apex rounded. Stamens inserted at c. 4.9 mm from the base; anthers already open in bud, linear, c. 2.3 × 0.4 mm, sessile. Disk conical, carnose, c. 0.2 mm high, 0.3 mm in diameter, glabrous. Style filiform, c. 2.8 × 0.2 mm, glabrous; stigmas absent. *Female flowers*: only buds seen, sessile. Bracteoles one per flower, filiform, 2–3 mm long. Hypanthium cylindrical, 1.2 × 0.7 mm, densely long sericeous. Calyx cylindrical, 1 × 0.4 mm, outside sparsely to moderately pubescent, inside glabrous, margins glabrous; lobes 4, ovate, 0.45–0.5 × 0.9–1 mm, outside glabrous, inside glabrous. *Fruits* 4–8 per infructescence, globose, 4–5 × 3–4 mm, with 4–5 ribs, sparsely pubescent; exocarp fleshy; locules 4–5, cylindrical, 3.3 × 0.5 mm; pedicel not flattened, 24–25 mm long, densely sericeous-lanate.

Distribution. New Guinea.

NEW GUINEA. East. Milne Bay Dist., Cape Vogel Peninsula, Menapi, Brass 21936 (L), Dabora, Saunders 151 (L); Trobriand I., Kiriwina I., Kaibola, Frodin UPNG 2037 (L); d'Entrecasteaux I., Normanby I., Maideba, Croft et al. LAE 68898 (L).

Ecology. In regrowths or in undergrowth of primary, secondary or disturbed lowland rainforest; also found along beaches. On reddish limestone soil (Saunders 151). Altitude 0–250 m.

Field notes. Outer bark cream brown, inner bark straw. Wood straw. Leaves yellow to dull dark green above, light to mid green below. Male flowers yellow. Ripe fruits red.

Vernacular name. Umaswakoakora (Minufia lang., Dabora).

Note. Easily recognizable by the conspicuous high number of flowers in the inflorescences, together with its relatively large leaves.

11. *Guettardella novo-britanniense* M.E. Jansen, *spec. nov.*

Arbores usque ad 30 m altae. Stipulae deciduae, ovatae, 4–7 mm longae, 2.5–4 mm latae, apicibus acutis ad 2 mm acuminatis. Lamina folii obovata ad oblanceolata, 19–23.5 cm longa, 7–11 cm lata, apice ad 15 mm acuminato, basi acuta ad rotundata, nervibus lateralibus 9–12 paribus. Inflorescentia et flores ignoti. Fructus oblongus, loculis 10; pedicello c. 23 mm longo. – *Typus*: White NGF 10058 (L, holo).

Trees up to 30 m high, d.b.h. up to 75 cm. Stipules not twisted, deciduous, ovate, 4–7 × 2.5–4 mm, not keeled, outside densely short sericeous, inside densely long sericeous, margins glabrous, apex acute to up to 2 mm acuminate. Petiole flattened to slightly canaliculate above, 3–15 mm, densely sericeous, glabrescent. *Leafblade* obovate to oblanceolate, 19–23.5 × 7–11 cm, chartaceous, above glabrous, midrib basally densely long sericeous, moderately so between lateral nerves, glabrescent, margin glabrous, apex up to 15 mm acuminate, base acute to rounded; lateral nerves 9–12 pairs. Inflorescences and flowers unknown. *Fruits* one per infructescence, oblong, 27–30 × 16–23 mm, glabrous; exocarp fleshy; locules 10, cylindrical, 22–24 × 1.5 mm; pedicel c. 23 × 1 mm, densely sericeous to floccose.

Distribution. New Britain.

NEW BRITAIN. South. Eliak Creek, White NGF 10058 (L); Pulie R., Henty & Frodin NGF 27229 (L).

Ecology. In rainforests on creekbanks; on limestone covered with red soil (Henty & Frodin NGF 27229). Altitude 0–30 m.

Field notes. Bark light grey brown or brown, shedding into irregularly small flakes. Blaze streaky yellow brown. Wood pale cream or orange. Ripe fruits red.

Vernacular name. Igey.

Note. Within the group of species with which *G. novo-britanniense* is related (see sub *G. erythrocarpa*), it closest resembles *G. schmutzii* in the high number of lateral nerves and the very large leaves and fruits.

12. *Guettardella obscura* M.E. Jansen, *spec. nov.* – Fig. 4.

Arbusculae usque ad 6 m altae. Stipulae caducae interdum deciduae, ovatae, (2–)3.5–7 mm longae, (1–)2–3.5 mm latae, apicibus 2.5–7 mm caudatae. Lamina folii obovata ad oblanceolata, (2.5–)3–8.5 cm longa, 1–4.5 cm lata, apice 4–11 mm acuminato, basi rotundata, nervibus lateralibus 6–9 paribus. Inflorescentia 3- vel 7–9-floribus, pedunculo 6–20 mm longo. Flores masculi sessiles. Bracteola una, 1–3 mm longa. Calyx cylindricus, 0.35–0.5 mm longus, c. 1.2 mm latus; lobi rotundati. Tubus corollae infundibuliformis, 4.9–5.3 mm longus, 0.6–0.75

mm diametro. Antherae c. 4.2 mm supra basin insertae. Discus obconicus, c. 0.25 mm altus, c. 0.4 mm diametro, dense pubescens. Stylus c. 1.8 mm longus, 0.15–0.18 mm latus, glaber; stigmata 0.5–0.55 mm longa, glabra. Flores feminei alabastria tantum video, sessiles. Bracteolae 3, 2.25–3.75 mm longae. Hypanthium campanulatum, c. 1 mm longus, c. 1.2 mm diametro. Calyx cylindricus, 0.6–0.9 mm longus, 0.9–1.2 mm latus. Fructus oblongus; loculis 4; pedicello 12–33 mm longo. — *T y p u s*: Endert 5397 (L, holo).

Small trees up to 6 m high. Stipules twisted, caducous (sometimes deciduous), ovate, (2–)3.5–7 × (1–)2–3.5 mm, sometimes slightly keeled, outside moderately short pubescent, below moderately short pubescent and long sparsely hirsute, laterally glabrous, inside densely long sericeous, margins glabrous, apex 2.5–7 mm caudate. Petiole rounded above, 3–12 mm, densely short sericeous and moderately velutinous, glabrescent. *Leafblade* obovate to oblong to lanceolate, (2.5–)3–8.5 × 1–4.5 cm, membranous, above sparsely pilose, glabrescent, below short sericeous, more densely so and sparsely velutinous on midrib and nerves, glabrescent, margins sparsely pilose, glabrescent, apex 4–11 mm acuminate, base rounded; lateral nerves 6–9 pairs. *Inflorescence* axillary, solitary, dichotomous, with either 7–9 male flowers or 3 female flowers; peduncle 6–15 mm long in male inflorescences, 15–20 mm long in female inflorescences, densely sericeous, glabrescent. *Male flowers*: sessile. Each flower except central one subtended by one bracteole, these filiform, 1–2(–3) × 0.15–0.3 mm, glabrous to sparsely pubescent. Calyx cylindrical, 0.35–0.5 × 1.2 mm, outside sparsely pubescent, inside glabrous; lobes ovate, 0.4–0.5 × 0.6–0.7 mm, outside sparsely pubescent, inside glabrous, apex rounded. Corolla tube infundibular, 5–5.5 × 0.6–0.75 mm, outside densely sericeous, inside glabrous; throat 1–1.2 mm in diameter, glabrous inside; lobes ovate, 0.7–1 × 0.8–0.9 mm, outside densely sericeous, laterally glabrous, inside glabrous, apex rounded. Stamens inserted at 4.2 mm from the base, anthers already open in bud, linear, 1.85–2 × 0.25 mm, sessile. Disk obconical, c. 0.25 mm high, c. 0.4 mm in diameter, densely pubescent. Style filiform, c. 1.8 × 0.15–0.2 mm, glabrous; stigmas 2, filiform, 0.5–0.55 mm long, glabrous. *Female flowers*: sessile. Each flower except central one subtended by 3 bracteoles, these filiform, 2.25–3.75 × 0.1–0.2 mm, moderately pubescent. Only buds seen. Hypanthium campanulate, c. 1 × 1.2 mm, densely long sericeous. Calyx cylindrical, 0.6–0.9 × 0.9–1.2 mm, outside densely sericeous, inside sparsely pubescent below, glabrous above; lobes oblong, c. 0.6 × 0.35–0.45 mm, apex rounded, densely sericeous outside, glabrous inside. Corolla tube cylindrical, outside densely long sericeous, inside glabrous; lobes outside densely sericeous, inside glabrous. *Fruits* 1–3 per infructescence, oblong, 4.3–4.5 × c. 2 mm, moderately short pubescent; exocarp fleshy; locules 4, cylindrical, c. 3.8 × 0.65–0.85 mm; pedicel 12–33 × c. 0.5 mm, moderately sericeous and velutinous.

Distribution. Borneo.

BORNEO. East. Kutei, Kombeng, Endert 5397 (L); G. Sekrat, S. of Sangkulirang, Koster-mans 5962 (L). — Sandakan. Kinabatangan, Bumbulud summit, Gomantong caves, Wood SAN A4623 (L).

Ecology. On forested hillridges, on (coral) limestone rock (Wood SAN A4623). Altitude 150–500 m.

Field notes. Bark smooth. Male flowers white.

Notes. The Gomantong hill, where *Wood SAN A4623* was found, is at the north-east of a fine-grained coral-foraminiferal limestone massif, Dulang Lambu. Small patches of limestone are scattered in Borneo. *Endert 5397* was collected in Kombeng, but Endert (1927) does not cite this specimen in his treatment of the limestone flora of the Kombeng. A number close to this, *Endert 5400 (Nauclea spec.)*, however, was mentioned by him as collected on limestone.

The hairy disk in the male flowers of *G. obscura*, rather a conspicuous character, is also present in *G. caudata*. In stipule and leaf characters these two species resemble each other too. The species differ in the unequal length of the calyx lobes in the male flowers, the longer peduncled male inflorescences and flower characters in *G. caudata*.

13. *Guettardella oriomonense* M.E. Jansen, *spec. nov.*

Arbusculae usque ad 18 m altae. Stipulae caducae, ovatae, 4–5 mm longae, 2–3 mm latae, apicibus acutis. Lamina folii oblonga ad obovata, 7–15.5 cm longa, 2.5–5.5 cm lata, apice acuto ad 10 mm acuminato, basi acuta, nervibus lateralibus 5–7 paribus. Inflorescentia c. 18-floribus. Flores ignoti. Fructus globosus ad ovoideus; loculis 9–10; pedicello 17–21 mm longo. – *T y p u s*: *White & Gray NGF 10439* (L, holo).

Trees up to 18 m high, d.b.h. up to 37.5 cm. Stipules not twisted, caducous, ovate, 4–5 × 2–3 mm, outside densely dark brown long sericeous, inside densely light brown long sericeous, margins glabrous, apex acute. Petiole rounded above, 8–15 mm, densely puberulous, glabrescent. *Leafblade* oblong to obovate, 7–15.5 × 2.5–5.5 cm, chartaceous, above glabrous or sparsely short pubescent on midrib and nerves, below long moderately sericeous on midrib and nerves, glabrescent, margin glabrous, apex acute to up to 10 mm acuminate, base acute, lateral nerves 5–7 pairs. *Inflorescences* axillary, solitary, dichotomous, with c. 18 male flowers; peduncle 23–25 mm long, densely puberulous-pubescent. Male flowers: sessile. Calyx cylindrical, undulate, 1.5–2 × 1 mm, moderately sericeous outside, glabrous inside. Female flowers unknown. Fruits 1 per infructescence, globose to ovoid, 17–27 × 11–25 mm, glabrous; exocarp fleshy; locules 9–10, cylindrical, 20–22 × 1–1.5 mm; pedicel rounded above, 17–21 mm long, densely puberulous.

Distribution. New Guinea.

NEW GUINEA. East. Gulf Dist., Bamu R., Cameron 21 (L); Western Dist., Oriomo R. *White & Gray NGF 10438, 10439* (both L).

Ecology. In rainforests. Altitude 0–120 m.

Field notes. Bark slightly flaky, greyish. Blaze streaky yellow. Sapwood and heartwood yellow. Male flowers greenish white.

14. *Guettardella ovatifolia* M.E. Jansen, *spec. nov.* – Fig. 3.

Frutices vel arbusculae usque ad 5 m altae. Stipulae deciduae, ovato-lanceolatae ad lanceolatae, 1–3 mm longae, 1–2 mm latae, apicibus acutae. Lamina folii oblonga vel ovata ad ovato-

lanceolata, 1.5–6.5 cm longa, 0.7–3.5 cm lata, apice acuto, basi rotundata ad obtusa, nervibus lateralibus 3–5 (–6) paribus. Inflorescentia 1–3-floribus, pedunculo 9–14 mm longo. Flores masculi pedicello 0–1.5 mm longo. Bracteola una, 1.5–3 mm longa. Calyx campanulatus, 0.6–0.7 mm longus, 0.9–1.1 mm diametro, lobi duo adiecentes aliis breviores. Tubus corollae infundibuliformis, c. 4.8 mm longus, c. 0.65 mm diametro. Antherae c. 4.3 mm supra basin insertae. Discus conicus, c. 0.6 mm altus, 0.3–0.5 mm diametro, sparse pubescens. Stylus c. 2 mm longus, c. 0.18 mm latus, glaber; stigmata nulla. Flores feminei ignoti. Fructus globosus; loculis 4–6; pedicello 10–11.5 mm longo. — *Typus*: *Brass* 18667 (L, holo).

Shrubs or treelets up to 5 m high. Stipules not twisted, deciduous, ovate-lanceolate to lanceolate, 1–3 × 1–2 mm, not keeled, outside moderately to densely pubescent, glabrescent, inside densely pubescent, margins densely pubescent, apex acute. Petiole flattened above, 2–8 mm, densely hispid-lanate, not glabrescent. *Leafblade* ovate to ovate-lanceolate or oblong, 1.5–6.5 × 0.7–3.5 cm, chartaceous, above sparsely hirsute on midrib and nerves, more densely so on lower 1/4, glabrescent, glabrous between them, below sparsely pilose on midrib, more densely so on lower 1/3, glabrescent, margin sparsely pilose, apex acute, base rounded to obtuse; lateral nerves 3–5 (–6) pairs. *Inflorescence* axillary, solitary, dichotomous, with either 3 male flowers or 1–3 female flowers; peduncle 9–14 mm long, glabrous or sparsely to moderately pilose. Male flowers: Pedicels 0–1.5 mm long, long moderately pubescent. Bracteoles one per flower, filiformous, 1.5–3 mm long, sparsely pilose. Calyx campanulate, 0.6–0.7 × 0.9–1.1 mm, outside long moderately sericeous, inside glabrous; lobes 4, two of them oblong, 0.3–0.8 × 0.25–0.35 mm, two of them lanceolate, 0.9–1.8 × 0.35–0.6 mm, outside long moderately sericeous, inside glabrous, apex acute. Corolla tube infundibular, c. 4.8 × c. 0.65 mm, at throat c. 1.25 mm in diameter, outside densely sericeous, inside glabrous, throat glabrous; lobes 4, almost orbicular, 0.9–1.1 × 1.1–1.2 mm, outside and inside glabrous, apex broadly rounded. Stamens inserted at c. 4.3 mm from the base; anthers already open in bud, linear, c. 1.65 × 0.3 mm, sessile. Disk fleshy, conical, 0.6 × 0.3 (basally) to 0.5 (apically) mm, sparsely pubescent. Style filiform, c. 2 × 0.2 mm, glabrous; stigmas 2, reduced. Female flowers unknown. *Fruits* solitary, globose, 4–8 mm in diameter, glabrous; exocarp fleshy; locules 4–6, cylindrical, 3–6 × 0.6–0.9 mm; pedicel 10–11.5 mm long.

Distribution. Australia.

AUSTRALIA. Queensland. Lockerbie near Somerset, Brass 18547 (L); Newcastle Bay near Somerset, Brass 18667, 18682 (both L); Brown's Creek, Pascoe R., Brass 19599 (L); Rocky R., Hyland 6821 (L); Old Lockhart River Mission, Hyland 6944 (L); between Snake Creek and Bromley Outstation, Hyland 8944 (L).

Ecology. In or on the edge of dry (coastal) rainforest; in the undergrowth of or gregarious in savanna forest. On sand. Altitude 0–75 (–150) m.

Field notes. Male buds green. Fruits black, fleshy.

Vernacular names. Yoko, lunisan (Newcastle Bay).

Note. In the unequally long lobes of the calyces of the male flowers, *G. ovatifolia* is related to *G. caudata*. The two species differ in the larger, long caudate stipules, the acuminate leaves and the longer peduncle of the male inflorescences in *G. caudata* and in the number of flowers in the male inflorescences.

15. *Guettardella pachyphylla* M.E. Jansen, *spec. nov.*

Arbores usque ad 27 m altae. Stipulae caducae, triangulatae, 5–6 mm longae, 2–3 mm latae, apicibus acutis vel 1.5 mm acuminatis. Lamina folii oblonga, 8.5–15.5 cm longa, 3.5–7 cm lata, apice ad 10 mm acuminato, basi rotundata, nervibus lateralibus 5–7 paribus. Inflorescentia 1- vel 11–14-floribus. Flores masculi et feminei ignoti. Fructus globosus vel oblongus; loculis 9–14; pedicella c. 15 mm longo. — *T y p u s*: Katik NGF 46553 (L, holo).

Trees up to 27 m high, d.b.h. up to 1.2 m. Stipules not twisted, caducous, triangular, 5–6 × 2–3 mm, outside densely puberulous to sericeous, inside densely long sericeous, margins moderately pubescent, apex acute or up to 1.5 mm acuminate. Petiole canaliculate, 5–13 mm, densely puberulous, glabrescent. *Leafblade* oblong, 8.5–15.5 × 3.5–7 cm, coriaceous, above glabrous, below densely pubescent-lanate on midrib and nerves, less densely so between them, not glabrescent, margins glabrous, apex up to 10 mm acuminate, base rounded; lateral nerves 5–7 pairs. *Inflorescence* axillary, solitary, dichotomous, with either 11–14 male flowers or 1 female flower; peduncle 15–18 × 1 mm in male inflorescences, 7–10 × 1 mm in female inflorescences, densely sericeous. *Male flowers*: only young buds present, sessile. Calyx campanulate to slightly spindle-shaped, truncate to undulate, outside glabrous above, densely sericeous below, inside densely sericeous, margin densely long sericeous. *Female flowers*: only buds present, sessile. Hypanthium cylindrical, 3–4 × 2.5 mm, short densely sericeous-lanate below, sparsely so above. Calyx cylindrical, truncate to undulate, 1.5 × 3 mm, outside sparsely sericeous-lanate, inside glabrous, margins glabrous. *Fruits* solitary, globose or oblong in outline, 20–25 × (12–) 18–23 mm, glabrous; exocarp fleshy; locules 9–14, 23–28 × 1 mm; pedicel c. 15 mm long, densely puberulous.

Distribution. New Guinea.

NEW GUINEA. East. Madang Dist., Sepi catchment, Gogol valley, Clunie LAE 63527 (L); Gogol R., Katik NGF 46639, 46553 (both L); Aupan logging area, Katik NGF 46642 (L).

Ecology. Flat, drained, sometimes mixed, lowland rainforest. Altitude 30–60 m.

Field notes. Bole straight, up to 20 m high. Bark grey to mid or dark brown; underbark green or orange brown to brown; inner bark yellow to orange-straw. Wood dark straw to yellow. Leaves dark or light green, waxy. Fruits immature light green, turning red in maturation.

16. *Guettardella putaminosa* (F.v.Muell.) Benth.

Timonius putaminosus F.v.Muell., *Fragm. Phyt. Austr.* 4 (1864) 92. — *G. putaminosa* Benth., *Fl. Austr.* 3 (1866) 418. — *Guettarda putaminosa* F.v.Muell., *Fragm. Phyt. Austr.* 9 (1875) 183. — *Bobea putaminosa* F.v.Muell. ex Jackson, *Index Kew.* 1 (1895) 315. — *Antirhea putaminosa* Bailey, *Queensl. Fl.* 3 (1900) 760. — *T y p e*: Thozet s.n. (MEL, holo; n.v.), Rockhampton.

Distribution. Australia (Queensland).

AUSTRALIA. Queensland. Barrabas Scrub, Hyland 6066 (L).

Ecology. In deciduous vine thicket. Altitude 300 m.

Field notes. Small trees 5 m high. Fruits almost black when ripe.

Note. *Guettardella putaminosa* may be considered as the most distinct species within the genus. The species is conspicuous for its very small leaves ($1.5\text{--}2.5 \times 0.7\text{--}1.3$ cm) with rounded to emarginate apices. The globose, black mature fruits are among the smallest present in this genus, with a diameter of c. 5 mm.

17. *Guettardella schmutzii* M. E. Jansen, *spec. nov.*

Arbusculae usque ad 10 m altae. Stipulae caducae, triangulatae, 5–6 mm longae, 2–2.5 mm latae, apicibus acutis. Lamina folii obovata, 16–22 cm longa, 6–10.5 cm lata, apice acuto vel ad 9–15 mm acuminato, basi attenuata, nervibus lateralibus 8–13 paribus. Inflorescentia, flores masculi et flores feminei ignoti. Fructus oblongus, solitarius; loculis 8; pedicello c. 22 mm longo. – Type: *Schmutz 4820* (L, holo).

Small trees up to 10 m high. Stipules not twisted, caducous (sometimes tardily so), triangular, $5\text{--}6 \times 2\text{--}2.5$ mm, outside densely light brown long sericeous, glabrescent, inside densely sericeous, margins sericeous, glabrescent, apex acute. Petiole canaliculate above, 9–20 mm, densely sericeous when young, glabrescent. *Leafblade* obovate, $16\text{--}22 \times 6\text{--}10.5$ cm, membranous, above glabrous, below moderately pubescent-sericeous on midrib and nerves, glabrescent, margins glabrous, apex acute or 9–15 mm acuminate, base attenuate; lateral nerves 8–13 pairs. Inflorescence and flowers unknown. *Fruits* one per infructescence, oblong in outline, $23\text{--}29\text{--}(40) \times 15\text{--}20\text{--}(29)$ mm, glabrous; exocarp fleshy; locules 8, cylindrical, $24\text{--}26 \times 1$ mm; pedicel c. 22 mm long.

Distribution. Lesser Sunda Islands.

LESSER SUNDA ISLANDS. Flores. Mangarai, Paku, *Schmutz 4820, 4948* (both L).

Ecology. Rainforest. Altitude 400–500 m.

Field notes. Fruits red when mature.

Note. I have named this species after Father E. Schmutz, SVD. Through numerous collections he contributes already for years considerably to the knowledge of the flora of Flores.

18. *Guettardella smithii* (Fosberg) M. E. Jansen, *comb. nov.*

Timonius smithii Fosberg, *Sargentia* 1 (1942) 121. – *Antirhea smithii* Merr. & Perry, *J. Arn. Arbor.* 26 (1945) 233. – Type: *A. C. Smith 1347* (n.v.).

Distribution. Fiji Islands.

FIJI ISLANDS. Viti Levu. Rewa, Veisari, Pillay & Apenisa 13679 (L). – Ovalau. West of Lovoni valley, Mt Korolevu, A. C. Smith 7664 (L); Mt Tana Lailai, A. C. Smith 7685 (L).

Ecology. In dense forests on ridges and crests.

Field notes. Trees up to 18 m high. Ripe fruits red.

19. Guettardella solomonense M.E. Jansen, *spec. nov.*

Arbusculae usque ad 18 m altae. Stipulae caducae, ovatae, (2–)4–5 mm longae, 1.5–2.5 mm latae, apicibus acutis vel ad 2 mm acuminatis. Lamina folii oblonga ad lanceolata, 6–12 (–13) cm longa, 2.5–4.6 (–6.3) cm lata, apice 4–10 (–15) mm acuminato, basi acuta, nervibus lateralibus 6–7 paribus. Inflorescentia, flores masculi et flores feminei ignoti. Fructus globosus, solitarius, loculis 6–10, pedicello 12–18 mm longo. – *T y p u s*: *Mauriasi* BSIP 17719 (L, holo).

Trees up to 18 m high. Stipules (not) twisted, caducous, ovate, (2–)4–5 × 1.5–2.5 mm, keeled, outside very short, very densely sericeous in the middle, laterally glabrous, inside long densely sericeous, margins densely sericeous, apex acute or up to 2 mm acuminate. Petiole flattened to a bit canaliculate above, 10–18 mm, densely short sericeous, glabrescent. *Leafblade* oblong to lanceolate, 6–12 (–13) × 2.5–4.5 (–6.5) cm, chartaceous, above glabrous, below densely short sericeous on midrib and nerves, glabrescent, margins glabrous, apex 4–10 (–15) mm acuminate, base acute, lateral nerves 6–7 pairs. Inflorescences and flowers unknown. *Fruits* 1 per infructescence, globose, 19–21 × 22–23 mm, glabrous; exocarp fleshy; locules 6–10, 18 × 1.5–2 mm; pedicel 12–18 mm long, densely short sericeous.

Distribution. Solomon Islands.

SOLOMON ISLANDS. Choiseul I. Oaka R., Gafui BSIP 18410 (L). – Santa Isabel I. Gehe R., Beer BSIP 7732 (L). – Santa Cruz I. Mauriasi BSIP 17719 (L).

Ecology. In well-drained primary forest, along riversides, on hillsides or on flat plains. Altitude 0–30 m.

Field notes. Bole at breast height up to 90 cm diam. Female flowers with creamy yellow corolla tube, not smelling. Fruits light green when young, red when mature.

20. Guettardella tenuiflora (Benth.) M.E. Jansen, *comb. nov.*

Antirhea tenuiflora F.v. Muell. ex Benth., Fl. Aust. 3 (1866) 418; F.v. Muell., Fragm. Phyt. Aust. 7 (1869) 48; White, J. Arn. Arbor. 27 (1946) 121; non Urban, Symb. Antill. 1 (1900) 438. – *Guettarda tenuiflora* F.v. Muell., Fragm. Phyt. Aust. 9 (1875) 183. – *Antirhea tenuifolia* Jackson, Index Kew. 1 (1893) 155. – *T y p e*: *Dallachy s.n.* (K, holo; MEL, iso; n.v.), Rockingham Bay.

Distribution. New Guinea, Australia.

NEW GUINEA. East. Western Dist., Morehead, Pullen 7191 (L); Tarara, Wassi Kussa R., Brass 8525, 8585 (both L); Weam, Ridsdale NGF 33621, Ridsdale & Galore NGF 33479 (both L).

AUSTRALIA. North Queensland. Cape York Peninsula, Irvine 922, 1708 (both L); Leo Creek, Upper Nesbit R., Brass 19861 (L); Etty Bay near Innisfail, Smith 3251; Lock Creek, along Davies Creek, Smith 12058 (L).

Ecology. In the undergrowth of lowland rainforest; along wet drainages, banks of creeks or streams, sometimes in closed savannah forest. Altitude 30–510 m.

Field notes. Shrubs to small trees up to 12 m high, d.b.h. up to 22.5 cm. Outer bark brownish, corky, pale brown within; inner bark pinkish to pale yellowish brown inwards. Male flowers pale or yellowish green to pale greenish cream to white; anthers brown. Fruits bright red, fleshy, pendant.

DUBIOUS SPECIES

Guettarda kajewskii Guillaum., J. Arn. Arbor. 13 (1932) 6. — *Timonius kajewskii* Fosberg, Bull. Torrey Bot. Club 70 (1943) 393; Merr. & Perry, J. Arn. Arbor. 26 (1945) 233. — Type: *Kajewski* 724 (n.v.).

The position of the species remains uncertain (see Introduction).

Guettardella sandwicensis (A. Gray) H. Mann, Proc. Amer. Ac. 7 (1866) 170, n.v. — *Chomelia* ? *sandwicensis* A. Gray, Proc. Amer. Ac. 4 (1859) 48. — Type: unknown.

EXCLUDED SPECIES

Antirhea bifida (Lam.) Johnston, J. Arn. Arbor. 16 (1935) 166. — Type: *Commer-son* s.n. = *Tournefortia bifida* Lam. (Boraginaceae).

Antirhea borneensis Valetton in Hall.f., Beih. Bot. Centralbl. 34 (1917) 43–45. — Syntypes: *Foxworthy* 278 (n.v.); *Hose* 64 (B, lost; K, L, iso) = *Timonius flavescens* (Jack) Baker.

Antirhea esquirolii Lévillé, Fl. Kouy-Tchéou (1914) 364. — Type: unknown, = *Ecdysanthera rosea* Hook. & Arn. (Apocynaceae), fide Lauener, Notes Roy. Bot. Gard. Edinb. 37 (1978/79) 131.

Antirhea ? *martini* Lévillé, Fedde Rep. 13 (1915) 178. — Syntypes: *Martin* 2300; *Cavalier* 1025, = *Sindechites henryi* Oliv. (Apocynaceae), fide Lauener, Notes Roy. Bot. Gard. Edinb. 37 (1978/79) 131.

Antirhea myrtooides (F.v.Muell.) Baill. — Type: *Dallachy* s.n. (MEL, holo; n.v.), = *Bobea myrtooides* (F.v.Muell.) Valetton. This species resembles *Guettardella putaminosa* closely.

Antirhea strigosa Korth., Ned. Kruidk. Arch. 2 (1851) 217. — Type: ? *Korthals* s.n. (n.v.). This species was probably described by Korthals on his own collection(s) from Sumatra, but in the Old World the genus is only known from the Mascarenes. The genus *Guettardella* has exclusively unisexual flowers, but *A. strigosa* was described by Korthals as having bisexual ones. *Guettardella* is so far unknown from Sumatra. It would therefore seem that the species does not belong to either genus. This may explain why no original material could be found in L, where all Korthals' original specimens are present. *Antirhea strigosa* could probably be the 'common Sumatran species' referred to by Hooker f. (Fl. Brit. India 3, 1880, 126, footnote).

ACKNOWLEDGEMENTS

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INDEX TO SCIENTIFIC NAMES

Numbers refer to the number of the accepted species, preceded by 1: for *Antirhea*, and 2: for *Guettardella*. New names and combinations are in bold type. Synonyms have '=' before the number of the species to which they belong. Dub. and Excl. refer to dubious and excluded species respectively.

Antirhea benguetensis Valetton = 2: 9
bifida Johnston Excl.
bifurcata Hook. f. 1: 2
borbonica Gmel. 1: 1
borneensis Valet. Excl.
chinensis Forbes & Hemsley = 2: 3
dioica DC. = 1: 1

var. *acuminata* DC. = 1: 1

var. *barbinervis* DC. = 1: 1

esquirollii Lév. Excl.

frangulacea DC. = 1: 2

hirsutiuscula Valetton = 2: 5

livida Elmer = 2: 7

martini Lév. Excl.

megacarpa Merr. & Perry = 2: 8

microphylla Merr. = 2: 9

myrtoides Baill. Excl.

philippinensis Rolfe = 2: 9

putaminosa Bailey = 2: 16

smithii Merr. & Perry = 2: 17

strigosa Korth. Excl.

tenuiflora Benth. = 2: 20

tenuifolia Jacks. = 2: 20

verticillata DC. = 1: 1

Bobea hirsutiuscula Teysm. = 2: 5

putaminosa Jacks. = 2: 16

Chomella sandwicensis A. Gray Dub.

Cunninghamia verticillata Willd. = 1: 1

Eriosolena affinis Zoll. = 2: 5

Guettarda barbinervis Cham. & Schlecht. = 1: 1

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verticillata Desr. = 1: 1

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Pyrostria hexasperma Roxb. = 2: 5

Stenostomum bifurcatum DC. = 1: 2

Timonius atropurpureus Craib = 2: 1

attenuatus Elmer = 2: 5

benguetensis Elmer = 2: 9

hirsutiusculus Elmer = 2: 5

hirsutus Ridley = 2: 1

kajewskii Fosb. Dub.

putaminosus F.v. Muell. = 2: 16

smithii Fosb. = 2: 17

trichocaulus Boerl. = 2: 5